

## Purdue: Systems Integrity for Defense Summit



### Architectural Design Challenges for Ground Vehicle CBM+ System of Systems

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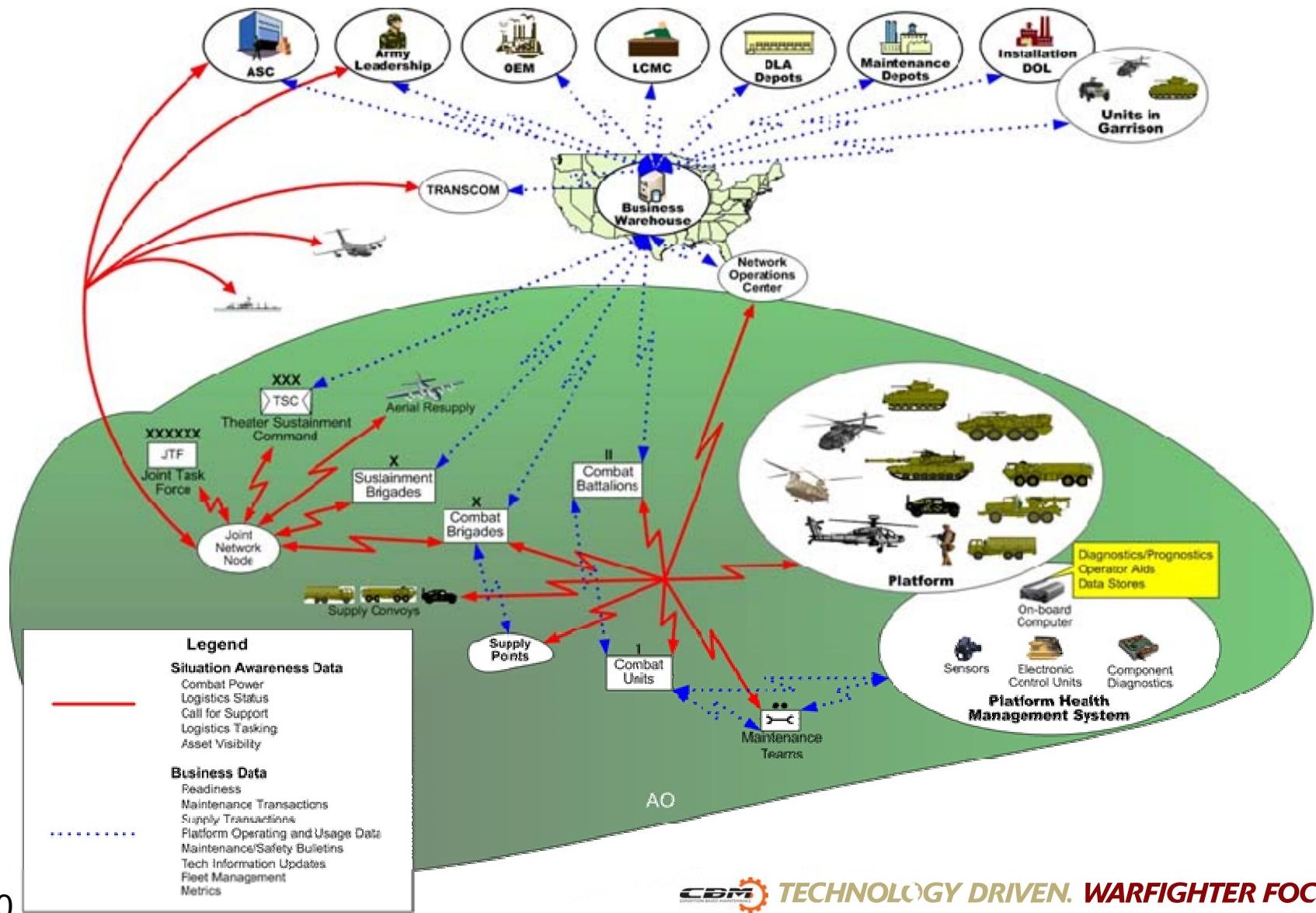
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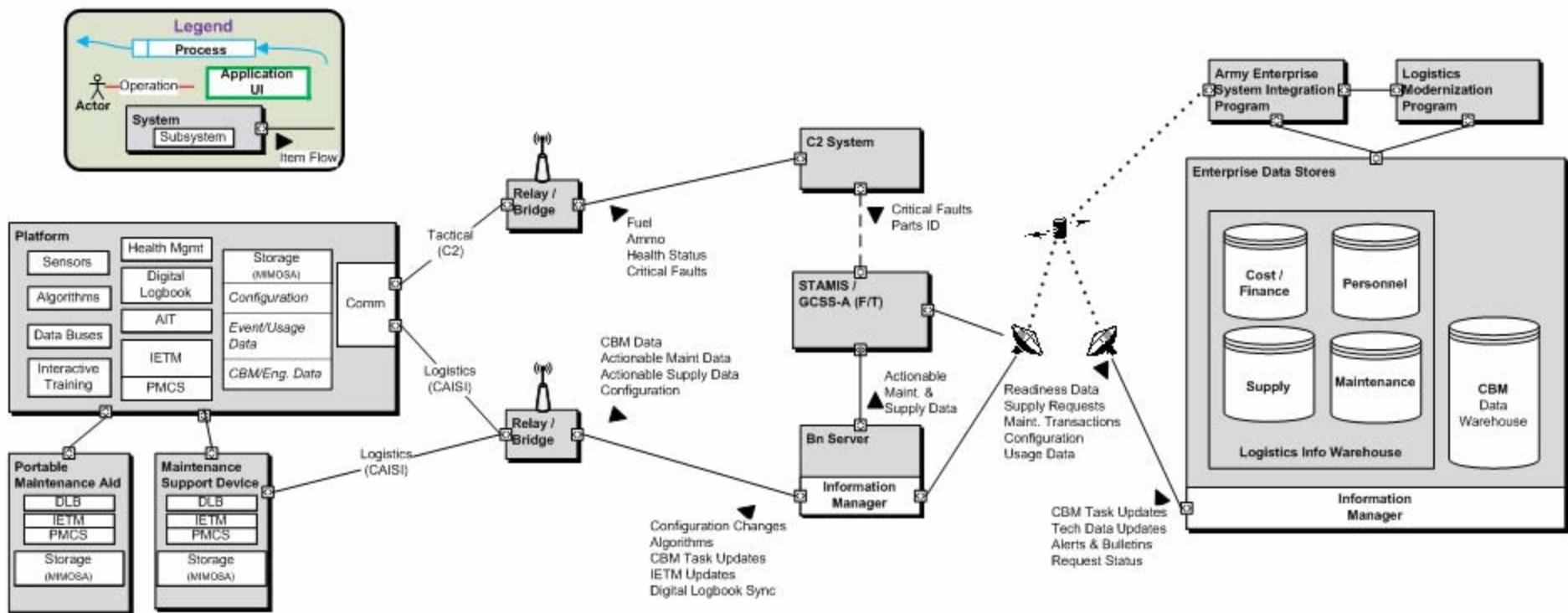
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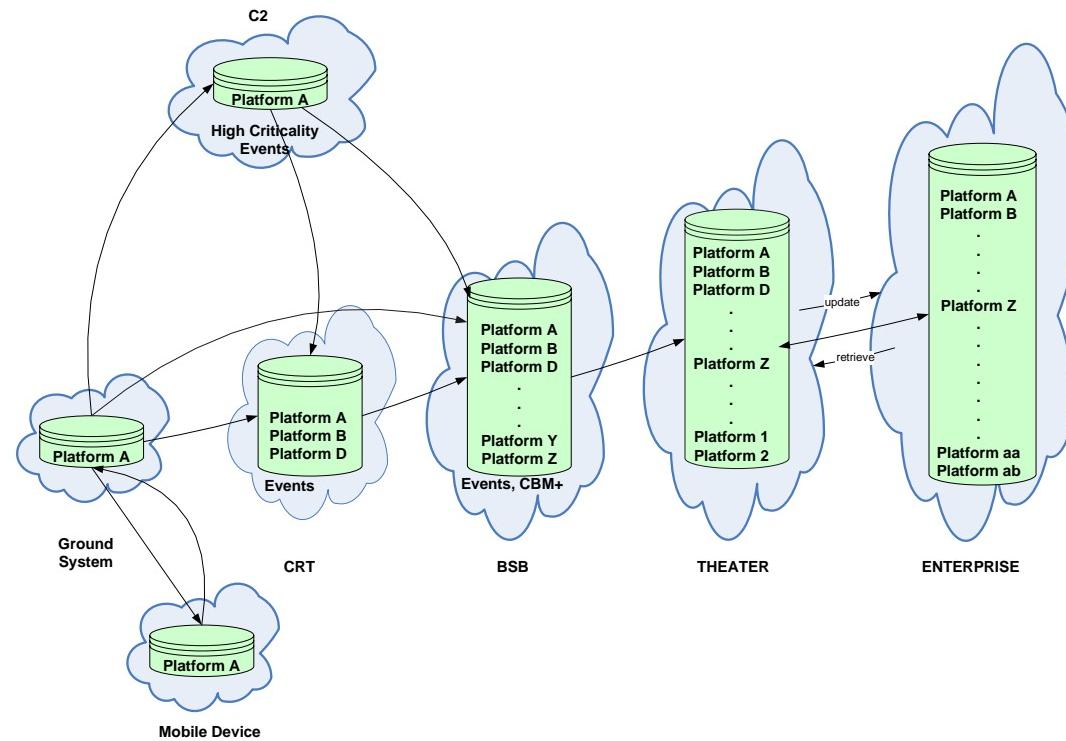
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- ❑ Operational View for CBM+ Systems of Systems
- ❑ Systems: Detailed View
- ❑ Data Synchronization Challenges
- ❑ Prognostic/Diagnostic Software Challenges
- ❑ Application Integration Challenges
- ❑ Army Integrated Logistics Architecture (AILA) for Interoperability
- ❑ Platform Software Architecture
- ❑ Summary





- ❑ Common data model needs to be maintained across the battlefield to avoid losing information or relationships in translation.
  - ❑ Helps to reduce communication transfer by exploiting static information (severity, effect, ambiguity group, maintenance tasks for an event, etc.)



## **Challenge: How to maintain data integrity across the Enterprise?**



# Prognostic/Diagnostic Software Challenges

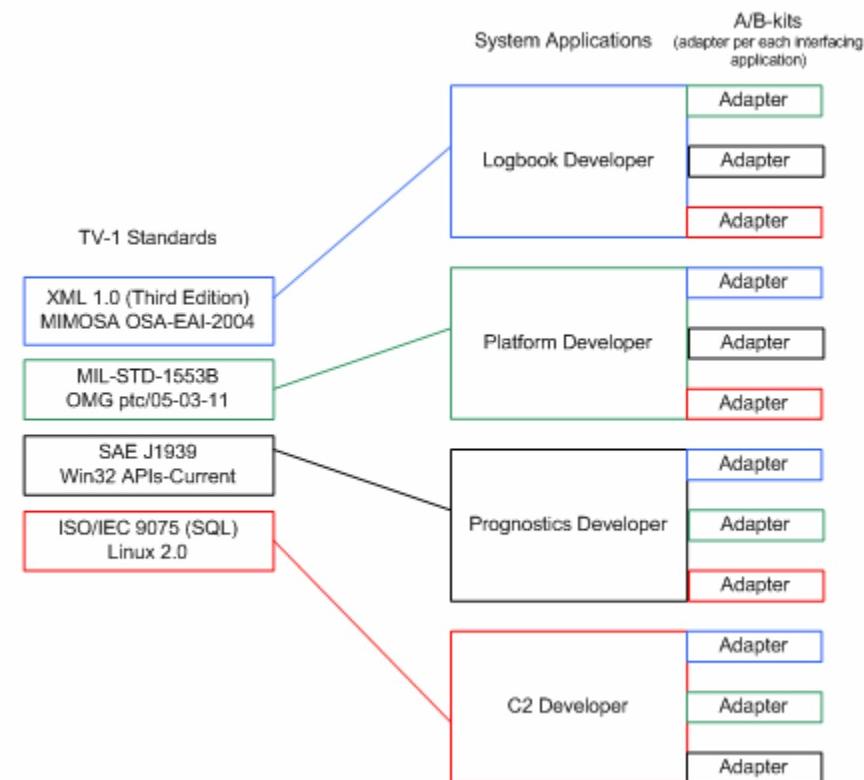


- ❑ Challenge 1: Deploying N proprietary systems with little to no interoperability between them due to tightly coupled/closed system designs. Creates a huge logistics burden: N training courses for maintainers, N software systems to configuration manage throughout the system lifecycle.
- ❑ Challenge 2: Availability of the RIGHT data to properly perform diagnostics, let alone prognostics.
- ❑ Challenge 3: Integrating disparate vendor code - could be implemented in several different languages, operating systems, and computer architectures.
- ❑ Challenge 4: No standard look and feel at the user interface level between systems.

- ❑ Each application makes adjustments to talk to other applications (system to system basis)
- ❑ This requires up to n-1 additional adapters for each new application ( $N^2$  problem)

### Incompatible:

- Physical buses
- Message protocols
- Operating Systems
- Databases



## Platform Enablers

- ❑ Self-reporting Assets & Components
- ❑ Fleet Management
- ❑ Supply Parts Ordering
- ❑ Maintenance Scheduling
- ❑ Digital Log Book
- ❑ Interactive Electronic TMs

## Onboard & At-Platform Prognostics/Diagnostics



- ❑ Sensors w/ Sensor Integration HW
- ❑ Vehicle Integrated Diagnostic Software (VIDS) w/ Algorithm Manager
- ❑ Vehicle Computer System



Sensors

Electronic Control Units

Component Diagnostics



## Interoperability

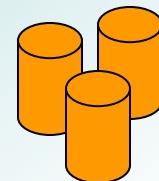
## Army Integrated Logistics Architecture (AILA)

- ❑ Enables Net-Centricity
- ❑ Defined using DoD Architectural Framework (DoDAF)
- ❑ Facilitates Interoperability

## Off-Platform Enablers

- ❑ Network Infrastructure
- ❑ Data Mining & Analysis Tools
- ❑ Fleet Trending and Pattern Recognition – Actionable Data
- ❑ Data Synchronization
- ❑ Logistics System Integration

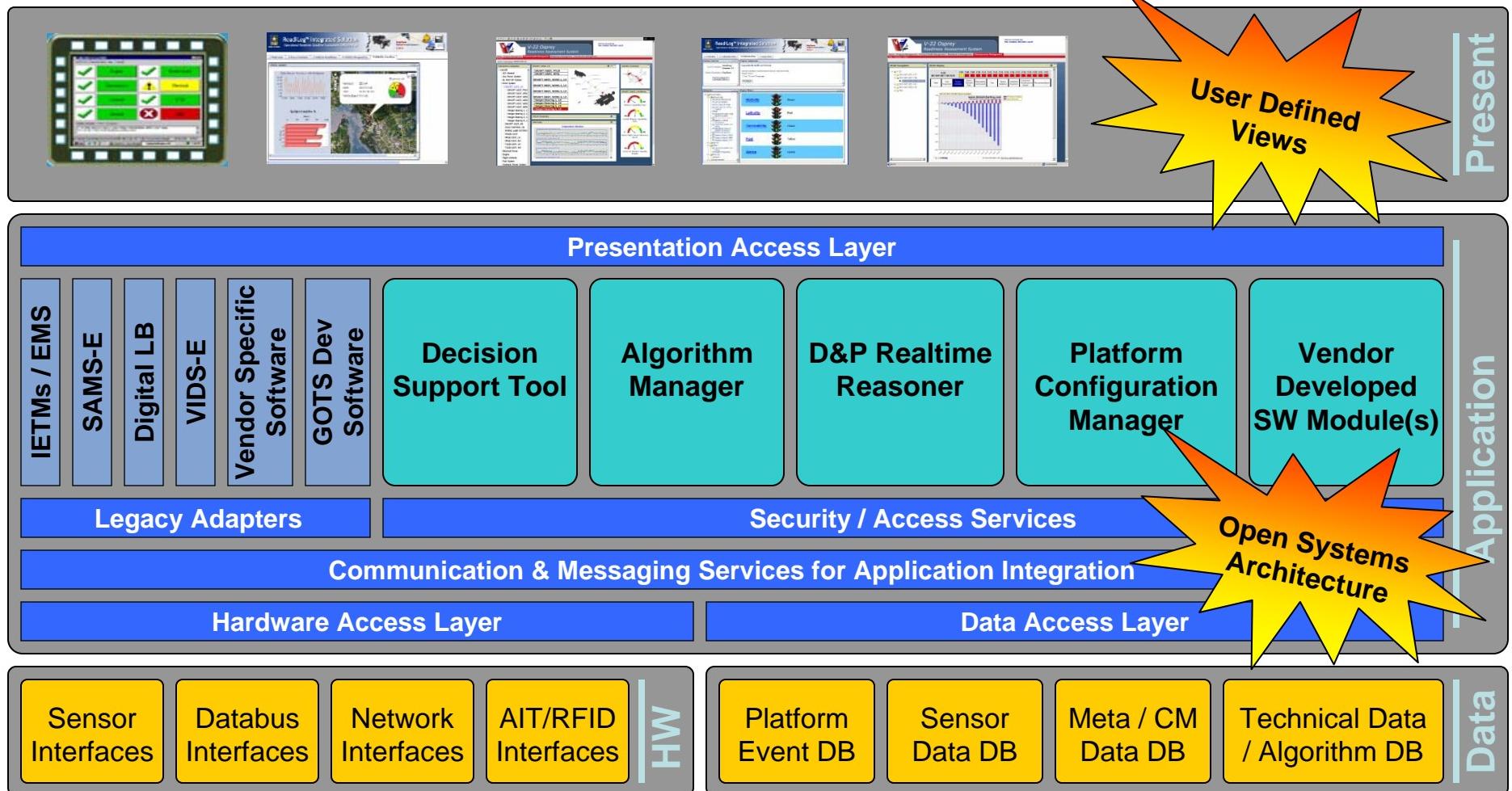
## Data Standards



- ❑ Common Data Format (CDF)
- ❑ MIMOSA
- ❑ Data Exchange Standards
- ❑ Defined Technical Views



# Platform Software Architecture



- ❑ Need to design architectures with openness, upgradeability, and scalability in mind.
- ❑ Must define the DoDAF Technical Views for systems with CBM+ community adopted standards using trade-off studies and proof of concept demonstrations.
- ❑ Design challenges are plentiful....